

Staff Analytical Note/Note analytique du personnel 2018-17

# Measuring Vulnerabilities in the Non-Financial Corporate Sector Using Industry- and Firm-Level Data



by Tim Grieder and Michal Lipsitz

Financial Stability Department  
Bank of Canada  
Ottawa, Ontario, Canada K1A 0G9  
[tgrieder@bankofcanada.ca](mailto:tgrieder@bankofcanada.ca)  
[mlipsitz@bankofcanada.ca](mailto:mlipsitz@bankofcanada.ca)

Bank of Canada staff analytical notes are short articles that focus on topical issues relevant to the current economic and financial context, produced independently from the Bank's Governing Council. This work may support or challenge prevailing policy orthodoxy. Therefore, the views expressed in this note are solely those of the authors and may differ from official Bank of Canada views. No responsibility for them should be attributed to the Bank.

## **Acknowledgements**

We thank Ron Morrow, Marc-André Gosselin and Brian Peterson for helpful discussions.

## Abstract

Aggregate non-financial corporate debt-to-GDP has been growing rapidly in recent years and is at an all-time high. This growth began in 2011 and accelerated as the oil price shock affected the Canadian economy. In light of these developments, we use industry- and firm-level data to measure vulnerability indicators in the non-financial corporate sector. We find that developments in the oil and mining sectors have had a noticeable impact on aggregate non-financial corporate indebtedness and other vulnerability indicators.

*Bank topics: Business fluctuations and cycles; Credit and credit aggregates; Financial stability; Monetary and financial indicators; Recent economic and financial developments; Sectoral balance sheet*

*JEL Codes: G, G0, G01, G3, G32*

## Résumé

Le ratio de la dette des sociétés non financières au PIB a augmenté rapidement ces dernières années et se situe à un sommet historique. Commencée en 2011, la hausse s'est accélérée à mesure que le choc des prix du pétrole faisait ressentir ses effets sur l'économie canadienne. C'est pourquoi nous utilisons des données sectorielles et des données sur les entreprises pour calculer des indicateurs de la vulnérabilité des sociétés non financières. Nous constatons que l'évolution des secteurs pétrolier et minier a eu des effets sensibles sur les indicateurs macroéconomiques de vulnérabilité, notamment ceux de la dette des sociétés non financières.

*Sujets : Cycles et fluctuations économiques; Crédit et agrégats du crédit; Stabilité financière; Indicateurs monétaires et financiers; Évolution économique et financière récente; Bilan sectoriel*  
*Codes JEL : G, G0, G01, G3, G32*

## Key results

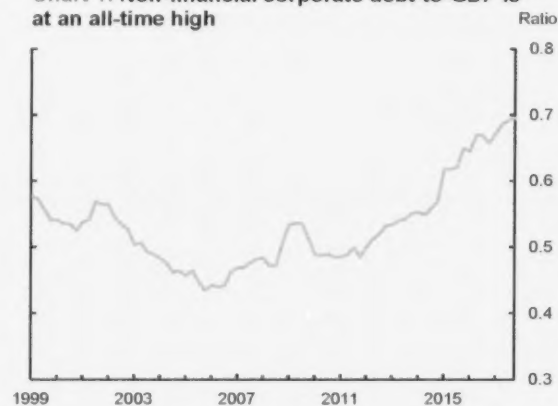
- Recently, debt-to-income ratios have been increasing across industries in the non-financial corporate sector, with exceptionally large increases in oil and mining. Excluding these two industries from the aggregate, we find that
  - the debt-to-income ratio is within its historical range,
  - increased cash holdings have pushed the ratio of net debt (debt minus cash) to income well below its historical average,
  - the debt-service ratio has been trending lower and would likely stay within its historical range if borrowing rates were to rise to historical averages, and
  - the ratio of liquid assets relative to short-term liabilities has been stable and is above its historical average.
- We also use firm-level data to track the share of aggregate debt held by firms that do not generate enough income and do not hold sufficient liquid assets to make debt-related payments.
  - This group, which consists primarily of mining firms, has grown over the past 10 years, reaching 18 per cent of total firms in 2016. Nevertheless, the share of debt held by these firms has remained at around 1 per cent over the past 10 years, except during the oil price shock, when it increased to 5 per cent.

## Non-financial corporate debt-to-GDP is at a historically high level

The ratio of aggregate non-financial corporate debt to gross domestic product (GDP) started increasing in 2011 and accelerated in 2014 as the Canadian economy was affected by the oil price shock (Chart 1). These developments pushed Canada's credit-to-GDP gap above thresholds used by the Bank for International Settlements (BIS) to identify future stress in the banking system.<sup>1</sup>

In light of the increase in non-financial corporate debt-to-GDP, we take a closer look at indebtedness in the non-financial corporate sector using industry- and firm-level data.<sup>2</sup> The industry-level analysis uses financial statements from Statistics Canada's Quarterly Financial Statistics for Enterprises (QFSE) and the firm-level analysis uses data from Compustat.<sup>3</sup> A description of these data sets can be found in the Appendix.

Chart 1: Non-financial corporate debt-to-GDP is at an all-time high



Note: Corporate debt excludes corporate claims.

Last observation: 2017Q4

Source: Statistics Canada Quarterly Financial Statistics for Enterprises, National Balance Sheet Accounts and Bank of Canada calculations

<sup>1</sup> For further details see T. Duprey, T. Grieder and D. Hogg, "Recent Evolution of Canada's Credit-to-GDP Gap: Measurement and Interpretation," Bank of Canada Staff Analytical Note No. 2017-25 (December 2017). This note also shows that Canada's credit-to-GDP gap is below the threshold that is worrisome once government-sponsored entities are excluded from the analysis.

<sup>2</sup> We exclude the real estate and rental and leasing industries, as they more closely resemble financial firms. This adjustment is commonly performed in analyses of the non-financial sector.

<sup>3</sup> Financial statement data from the QFSE are used as an input into the National Balance Sheet Accounts. The firm-level data from Compustat are from a sample of firms that have issued public equity or debt.

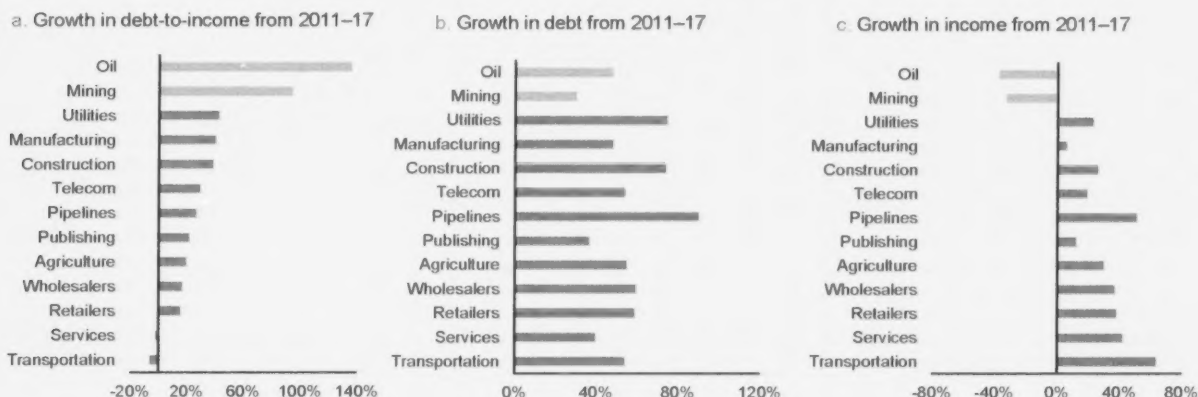
## Aggregate debt-to-income is within historical ranges once oil and mining are excluded

In line with the increase in corporate debt-to-GDP, the ratio of non-financial corporate debt to income has increased by approximately 30 per cent since 2011. In our analysis, debt refers to all interest-bearing borrowings (e.g., bank loans, bonds, etc.) from non-affiliated companies. Income is defined as earnings before interest, tax, depreciation and amortization (EBITDA), which proxies for the cash earned from ongoing operations.<sup>4</sup>

To identify whether certain industries may be driving the recent increase in non-financial corporate debt-to-income, we calculate the percentage change in debt-to-income ratios since 2011 at the industry level.<sup>5</sup> While debt-to-income has increased across almost all sectors, growth was particularly strong in oil and mining (Chart 2). Reflecting these developments, debt-to-income ratios in the aggregate non-financial corporate sector as well as the oil and mining sectors are near all-time highs (Chart 3).<sup>6</sup>

Although the aggregate debt-to-income ratio is near historical highs, it remains within historical ranges when the oil and mining sectors are excluded. Moreover, the increase in debt has been accompanied by an increase in cash holdings, which, if used to pay down outstanding debt, would bring the aggregate (excluding oil and mining) net debt-to-income ratio below its historical average (Chart 4).

**Chart 2: Since 2011, debt-to-income in oil and mining has increased substantially**



Sources: Statistics Canada Quarterly Financial Statistics for Enterprises and Bank of Canada calculations

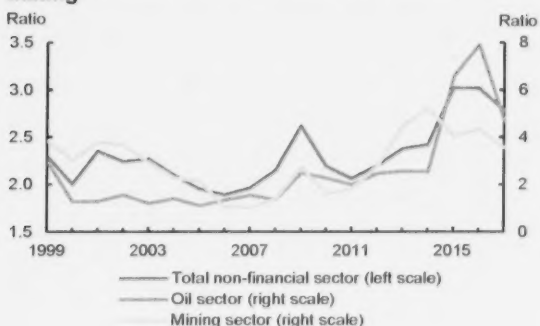
Last observation: 2017

<sup>4</sup> For the US non-financial corporate industry, Moody's notes that the ratio of debt to operating profits has a much higher correlation to future default rates for lower-rated bonds, making it a better vulnerability indicator than debt-to-GDP. For further details see Moody's Analytics, "Debt-to-profits outperforms debt-to-GDP," Moody's Weekly Market Outlook (29 March 2018).

<sup>5</sup> We calculate percentage changes rather than the change in levels since the level of debt-to-income ratios varies significantly across industries.

<sup>6</sup> The oil sector has a bigger impact on the aggregate debt-to-income ratio since its income and debt levels are larger than those of the mining sector.

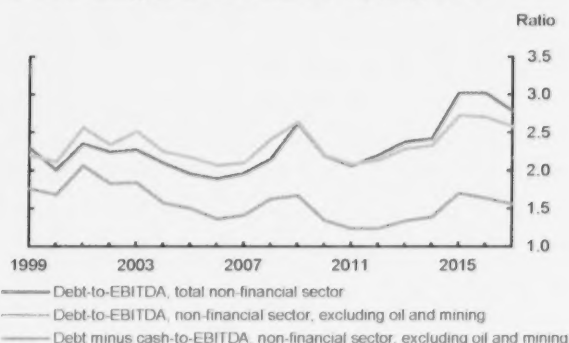
**Chart 3: Debt-to-income is near all-time highs in the non-financial corporate sector as well as in oil and mining**



Source: Statistics Canada Quarterly Financial Statistics for Enterprises and Bank of Canada calculations

Last observation: 2017

**Chart 4: Excluding oil and mining and accounting for cash holdings, debt-to-income is edging lower**



Note: EBITDA is earnings before interest, tax, depreciation and amortization

Sources: Statistics Canada Quarterly Financial Statistics for Enterprises and Bank of Canada calculations

Last observation: 2017

Excluding oil and mining, the aggregate debt-service ratio would likely remain within historical ranges if borrowing rates increased to their long-term average

In the context of rising interest rates, we measure the debt-service ratio (DSR) in the non-financial corporate sector both at current borrowing rates and under a hypothetical shock that pushes borrowing rates immediately higher by 2 percentage points.

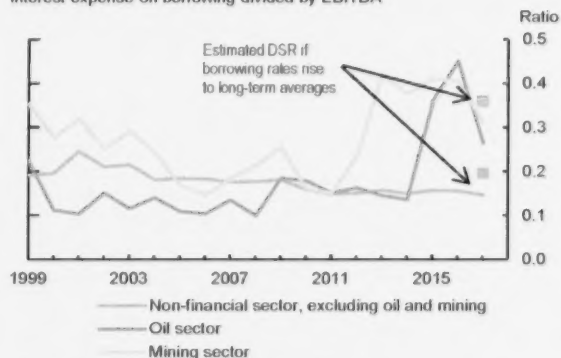
The DSR (interest expense/EBITDA) measures whether non-financials are generating enough income to meet their interest expense at current borrowing rates.<sup>7</sup> Excluding the oil and mining sectors, the aggregate DSR has been trending lower and is currently at historically low levels. In contrast, DSRs in the oil and mining sectors are substantially higher than they were in the past (Chart 5).

To assess the potential impact on DSRs of a shock to borrowing rates, the following assumptions are used:

- Implied borrowing rates are backed out from industry-level financial statements.
- We then assume that
  - (i) borrowing rates return immediately to their historical averages,
  - (ii) all debt must be immediately refinanced at these higher rates, and
  - (iii) EBITDA remains at its current levels.

**Chart 5: The aggregate debt-service ratio excluding oil and mining is at a historically low level**

Interest expense on borrowing divided by EBITDA



Note: EBITDA is earnings before interest, tax, depreciation and amortization. DSR is the debt-service ratio.

Sources: Statistics Canada Quarterly Financial Statistics for Enterprises and Bank of Canada calculations

Last observation: 2017

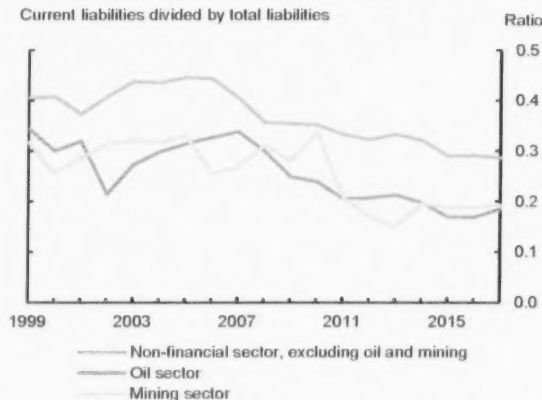
<sup>7</sup> Our DSR is the inverse of the interest coverage ratio and does not include principal repayments since the QFSE does not provide this information. As a result, our DSRs (i) are not comparable to those published by the BIS, which do contain an estimate of principal repayment due within a year and (ii) do not provide information regarding the degree of rollover risk faced by non-financial corporates.

Results from this exercise suggest that borrowing costs would rise by about 2 percentage points across industries and would push DSRs higher by about 10 percentage points in the oil sector and 5 percentage points (Chart 5) in each of the other sectors. This would leave the aggregate DSR in the non-financial sector excluding oil and mining well within historical ranges, while DSRs in the oil and mining sectors would remain above long-term averages.

Our shock scenario is necessarily simplistic since we do not know how EBITDA would evolve, whether firms would alter their funding sources, the maturity structure of the outstanding debt and the breakdown of fixed- versus floating-rate debt. Nevertheless, financial statements do allow us to measure the proportion of total liabilities that are coming due in the next year.<sup>8</sup> Roughly, the lower this proportion, the more likely that borrowing costs are fixed rather than floating in the near term; hence, firms will have some time to adjust to higher rates. Across all industries, the proportion of liabilities coming due within a year is near an all-time low, which suggests firms will likely have some time to adjust to higher borrowing rates (Chart 6).

**Chart 6: The ratio of current liabilities to total liabilities has declined across industries**

Current liabilities divided by total liabilities



Sources: Statistics Canada Quarterly Financial Statistics for Enterprises and Bank of Canada calculations

Last observation: 2017

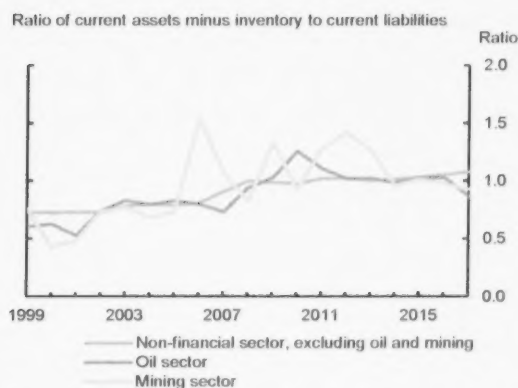
## Trends in the oil and mining sectors differ from the rest of the non-financial sector for additional vulnerability indicators

To expand our analysis, we analyze two additional vulnerability indicators.

First, the **quick ratio** measures the amount of liquid assets available to firms to repay their debt coming due within the year. Current assets include cash and any other assets expected to be converted to cash within one year (e.g., holdings of financial assets, accounts receivables, inventories, etc.). Current liabilities include any amounts payable due within one year (e.g., accounts payable, current portion of long-term debt, short-term debt, wages, etc.). The quick ratio for the aggregate non-financial corporate sector excluding oil and mining has been stable, while it has been trending lower for both the oil and mining sectors recently (Chart 7). This latest decline in the oil and mining sectors may reflect the need for firms to draw down liquid assets to make payments associated with short-term liabilities.

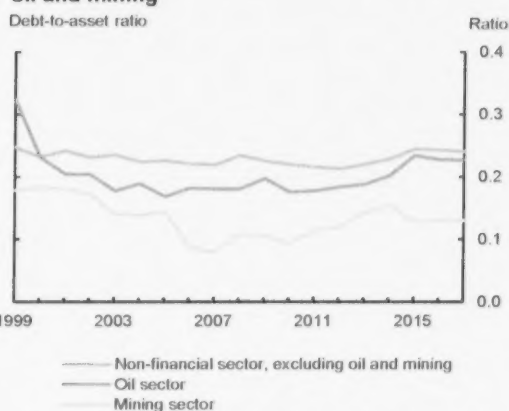
<sup>8</sup> Caution is warranted when interpreting results based on current assets and current liabilities due to the level of quality of these two variables. Please note that these variables are not officially published by Statistics Canada and have been provided to the Bank of Canada for analytical purposes only.

**Chart 7: The quick ratio has remained stable outside of oil and mining**



Sources: Statistics Canada Quarterly Financial Statistics for Enterprises and Bank of Canada calculations Last observation: 2017

**Chart 8: Leverage has remained stable outside of oil and mining**



Sources: Statistics Canada Quarterly Financial Statistics for Enterprises and Bank of Canada calculations Last observation: 2017

Second, the **debt-to-asset ratio** is a measure of leverage; the higher this ratio, the smaller the decline in asset values that must occur before creditors are not paid in full in the event of default. Excluding oil and mining, the ratio of debt to assets has remained almost completely unchanged over the past 20 years (Chart 8). In the oil and mining sectors, the debt-to-asset ratios were trending higher but have recently stabilized and remain within historical ranges.

This relative stability in the debt-to-asset ratio is not a result of elevated asset valuations. The impact of changes in asset values due to higher asset prices can be tracked, since non-financial corporates must report the amount that an asset is written up as income. Since 1999, the impact of changes in market prices on asset values has been very small, ranging from -1.2 to +0.4 per cent of total assets.<sup>9</sup>

Firms that do not generate enough income and do not hold sufficient liquid assets to make debt-related payments hold a small share of the overall debt

In this firm-level analysis, we combine two common financial ratios—the debt-service ratio and the current ratio—to identify firms that do not generate enough income to cover their interest expense (i.e., firms with weak debt-servicing ability) and do not hold sufficient liquid assets to cover their liabilities coming due within the year (i.e., low-liquidity firms).<sup>10</sup> We then track the evolution of the share of aggregate debt held by these firms over time. Debt includes both bank loans and debt raised in capital markets.

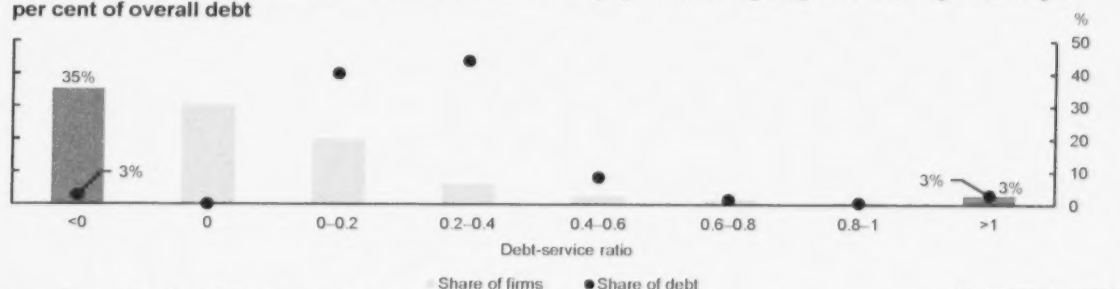
In 2016, approximately 38 per cent of firms were unable to cover their interest payments using only income. These firms can be split into two groups: (i) firms with a negative DSR resulting from negative income and (ii) firms with a DSR above 1 (Chart 9). Nevertheless, these two groups together accounted for only 6 per cent of total outstanding debt.

<sup>9</sup> The data used in this note reflect what is recorded on financial statements under appropriate accounting standards (e.g., International Financial Reporting Standards). Some assets (e.g., holdings of financial securities) may be recorded at current market prices but most (e.g., machinery, accounts receivable) are likely recorded at cost (less depreciation or allowance for doubtful accounts). Note that at times, the value attributed to shareholder equity on the balance sheet is replaced by the stock market's valuation of the company to convert from "book value" to "market value." The data used in this report are measured in book value, since shareholder equity is not adjusted to market value.

<sup>10</sup> We combine two ratios, one income-based and the other asset-based, in part because certain sectors may maintain higher balance sheet liquidity to compensate for higher income volatility.

In addition to their income, firms can also use their liquid assets to cover their debt-related payments.<sup>11</sup> Using the current ratio, 35 per cent of firms do not have sufficient current assets (e.g., cash holdings, accounts receivable, inventory) to pay back liabilities due within the year (Chart 10). The share of debt held by these firms has fluctuated between 50 and 60 per cent of total debt over the past 10 years.

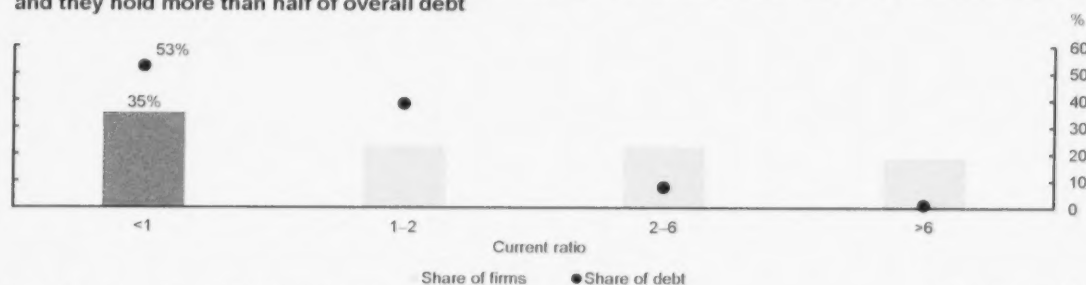
**Chart 9: While 38 per cent of firms cannot cover interest payments using only income, they hold only 6 per cent of overall debt**



Source: Compustat and Bank of Canada calculations

Last observation: 2016

**Chart 10: Approximately 35 per cent of firms cannot cover current liabilities using only current assets, and they hold more than half of overall debt**



Source: Compustat and Bank of Canada calculations

Last observation: 2016

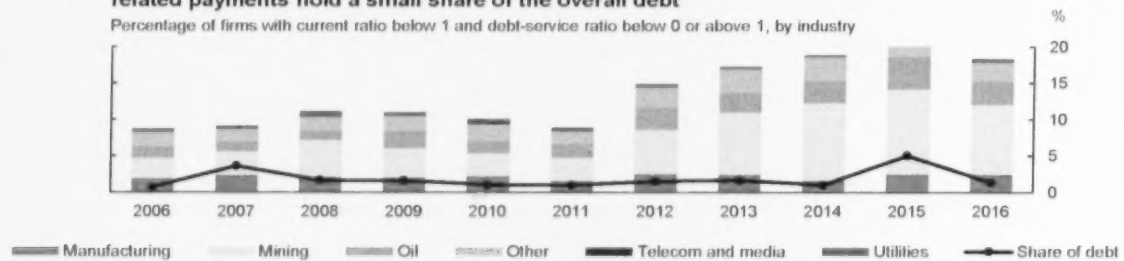
Since a lack of income and liquid assets relative to debt-related payments could be indicative of financial stress, we track the share of aggregate debt held by firms with both relatively low debt-servicing ability *and* relatively low liquidity.<sup>12</sup> Since 2011, the share of firms with these two characteristics has increased from 9 to 18 per cent, driven largely by the mining sector (Chart 11). Nevertheless, the share of aggregate debt held by these firms has plateaued around 1 per cent since the financial crisis, excluding a one-time increase in 2015 due to the oil price shock.<sup>13</sup>

<sup>11</sup> These firms may also be able to sell longer-term assets, reduce dividends, issue equity or issue additional debt to make debt-related payments. We exclude these possibilities from our analysis.

<sup>12</sup> Alternatively, if we track firms with *either* weak debt-servicing ability *or* low liquidity (or both), they account for 55 per cent of all firms and 57 per cent of total outstanding debt in 2016. These shares have been largely stable over the entire sample period. See Chart A-2 in the Appendix.

**Chart 11: Firms that do not generate enough income and do not hold sufficient liquid assets to make debt-related payments hold a small share of the overall debt**

Percentage of firms with current ratio below 1 and debt-service ratio below 0 or above 1, by industry



Sources: Compustat and Bank of Canada calculations

Last observation: 2016

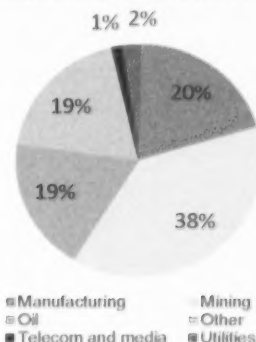
## Appendix

### Data

The industry-level analysis uses data from Statistics Canada's Quarterly Financial Statistics for Enterprises. The survey captures detailed income statement and balance sheet items from Canadian enterprises, reflecting economic and financial activity taking place on Canadian soil.<sup>14</sup>

The firm-level analysis uses financial statements from the Compustat database. This database contains a sample of firms from around the world that have issued equity or debt (e.g., Hydro Quebec) to the public. We include only those firms with headquarters located in Canada. The financial statements obtained from Compustat reflect a firm's global operations and thus do not necessarily reflect economic activity taking place in Canada. Chart A-1 shows a breakdown of the sample by industry.

Chart A-1: Share of firms by industry in the Compustat database (2006–16)

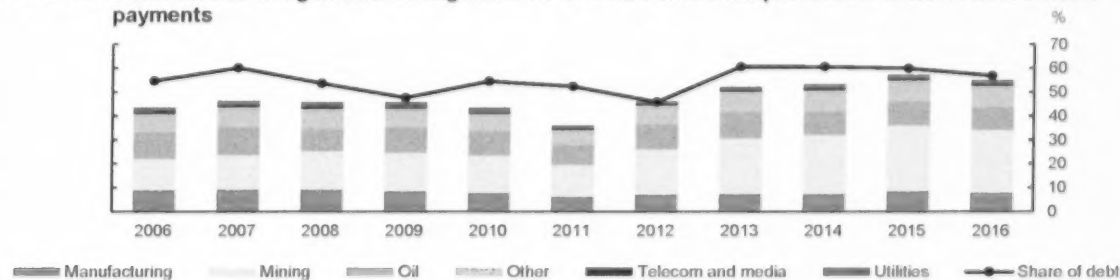


Sources: Compustat and Bank of Canada calculations

Firms that don't generate enough income or hold sufficient liquid assets to make debt-related payments hold a meaningful share of overall debt

Since firms can use both their assets and their income to make debt-related payments, we tracked the share of debt held by firms that did not generate enough income and did not hold sufficient assets to make debt-related payments. If we instead track firms that have only one of these characteristics rather than both, this group accounts for 55 per cent of total firms, and their share of total outstanding debt was 57 per cent in 2016 (Chart A-2).

Chart A-2: Firms that do not generate enough income or hold sufficient liquid assets to make debt-related payments



Sources: Compustat and Bank of Canada calculations

Last observation 2016

<sup>14</sup> An enterprise can be a single corporation or a family of corporations under common ownership. Enterprises may also have affiliates, which are other enterprises whose operations are influenced by a common owner or group of owners residing outside of Canada.